# Charge to the COUPP 4kg Review

April 2010

The COUPP 4kg bubble chamber completed a successful run in the MINOS underground area in the fall of 2009. The experiment achieved significantly lower internal background rates relative to prior runs through the use of a synthetic silica vessel and improved fluid handling. In addition, they successfully deployed a system of acoustic sensors for $\alpha$ discrimination. The result of this run has been world's best limits in spin dependent WIMP searches. The run ended in December with a controls/DAQ problem that resulted in damage to the bellows.

The COUPP collaboration proposes to repair the 4kg chamber and deploy it at SNOLab by summer 2010. The goals of operation at this deep underground site include determining the rejection power of the acoustic sensors and a new physics run. While estimated resource requirements for this effort are modest, the available labor resources are very limited and there are currently no DOE funds available for this activity. The COUPP collaboration is also busy deploying the 60kg chamber at MINOS and plans to deploy the 60kg chamber at SNOLab within the next year.

The purpose of this review is to evaluate the technical and scientific merits of operating the 4kg chamber at a deep underground site and the feasibility of the proposed deployment plan. This plan should be evaluated within the context of the overall COUPP experimental program.

Scientific and Technical Merit:

1. Will operation at a deep underground site significantly advance the state of the art of bubble chambers for DM searches?
2. Are the proposed science goals significant enough to warrant operation of the 4kg chamber in a deep site, in light of the expected deployment of the 60kg chamber within the next year?
3. What are the conflicts or synergies between operation of the 4kg and 60kg devices?

Technical preparedness:

1. Is the 4kg chamber sufficiently well documented to be reviewable with respect to electrical and mechanical engineering and ES&H?
2. Have the controls and DAQ problems encountered in December 2009 been satisfactorily resolved?
3. Is the system robust enough for extended operation in a remote location?

Resource requirements:

1. Does the proposed plan cover all of the steps likely to be required for this deployment?
2. What labor (scientific, engineering and technician) and M&S resources will be needed? Are the estimates reasonable and well justified?
3. Are the resource estimates consistent with past experience with the 4kg chamber?
4. Are there areas that are likely to require contingency beyond the estimates?
5. What is the plan for operating the 4kg chamber at SNOLAB, in light of the need to simultaneously operate the 60 kg chamber in the NUMI tunnel? Evaluate the manpower and travel required to accomplish this.
6. Will work on the 4kg deployment by technicians, engineers or scientists incur any significant delays in commissioning the 60kg chamber in the MINOS underground area?
7. How does COUPP propose to fund this effort?